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ABSTRACT

There are many children, termed "perseverative," whose reading comprehension problems stem from the fact that they form hypotheses about the meaning of a text at the onset of reading, then fail to evaluate or modify those hypotheses on the basis of subsequent text findings. A study was undertaken to identify such readers and to explore the effects of their disability on their comprehension and recall of deductive and inductive text. Sixteen perseverative fifth and sixth grade students were identified through the use of a screening device that had been especially devised for the purpose. Another 16 students were chosen who did not display this disability for a comparative group. Each child completed four tasks: (1) a misleading paragraph task, designed to mislead children who apply an initial unconfirmed text interpretation; (2) a recall task that required each child to read and recall details about eight inductive paragraphs; (3) a word finding task that required each child to define a nonsense word through the content of the paragraph; and (4) a reading rate test, in which the children read four inductive and four deductive paragraphs while being timed. The results revealed that there are readers who use a perseverative text interpretation strategy and that these readers find it more difficult to comprehend inductively structured text than deductively structured text. (FL)

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CHILDREN WITH A PERSEVERATIVE TEXT PROCESSING STRATEGY: THE EFFECT OF TEXT ORGANIZATION

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The reading comprehension process has been viewed in recent literature within a framework of hypothesis testing (Collins, Brown, & Larkin, 1980; Rubin, 1977). That is to say, in order to derive meaning from text, the reader must construct tentative hypotheses for what the material will be about. The reader must go through an active process of evaluation and test various possible interpretations of the text. The reader must finally construct a plausible model that takes into account all of the details in the text. If a promising interpretation fails to account for some aspect of the text, one has the options of accepting the interpretation as adequate in spite of its flaws or rejecting it as inadequate and searching for other possible interpretations. Thus, a basic process in comprehension is testing plausible hypotheses and evaluating goodness of fit.

The model that a reader constructs for a text is based upon what has been termed "schemata." A schema is an abstract description of a thing or an event. It characterizes the typical relationship among its components and contains a slot for each component that can be instantiated (Pichert & Anderson, 1977). Schemata exist for generalized concepts that underlie objects, situations, and events. We say that a schema "accounts for" a situation whenever the situation

can be interpreted as an instance of the schema (Rumelhart & Ortony, 1977). Interpreting a message, according to schema theory, involves a matching of information in the message to the slots in the schema. The information entered into the slots is said to be subsumed by the schema.

Some processes in reading comprehension are top-down or conceptually-driven processes (Adams & Collins, 1977; Anderson, Spiro, & Anderson, 1977). Rather than analyzing every component of a text, the reader formulates possible hypotheses about the text and undergoes a process of accepting or rejecting those hypotheses. The reader's expectations about the content of a text represent a form of preprocessing that should make subsequent analysis more efficient.

Other processes in reading comprehension are bottom-up or data-driven processes (Gough, 1972; Bobrow & Norman, 1975). These processes extend through a series of levels, beginning with an analysis of letter features, then combining information to identify letters, words, and the meanings of combinations of words.

The interactionist view of reading comprehension emphasizes that both top-down and bottom-up processes are necessary and take place at many levels simultaneously (Rumelhart, 1976). The reader obtains information from an analysis of the initial portions of the text, relates this information to schemata that appear to be relevant, and constructs hypotheses that guide further analysis. Often, even the initial analysis is guided by the reader's goal or by expectations based on the situational context (Kintsch, 1979).

Spiro (1979) has proposed that some poor readers develop a particular approach to the task of comprehension that over-emphasizes either top-down or bottom-up processes. He proposes that some readers tend to use more "knowledge-based" processes while others rely on more "text-based" processes. The top-down, or knowledge-based, reader relies too much on world knowledge and on hypotheses based upon earlier portions of the text. The bottom-up, or text-based, reader relies too much on details in the text and fails to use world knowledge to guide text processing and to provide a framework for constructing the meaning of the text.

There appears to be a number of children whose reading comprehension problems represent a particular type of overemphasis on top-down processing. In order to derive meaning from text, a good reader constructs tentative hypotheses about the meaning of the text that has been read and about the content yet to come, but the hypotheses remain tentative until all of the related information has been accounted for. One particular type of poor reader forms hypotheses but fails to evaluate and modify them appropriately on the basis of subsequent text. Specifically, these readers tend to formulate at the outset an hypothesis about the meaning of the text, then hold on to that interpretation rigidly in spite of disconfirming information in the later text. Instead of testing this interpretation against all of the new information as they read, these readers may misperceive or misconstrue later portions of the text, conforming them to the original interpretation rather than

changing the interpretation.

The main purposes of the present study were to show that there is a group of children with a reading comprehension disability who can be characterized as perseverative in their reading comprehension strategy and to explore the effects of this strategy on the comprehension and recall of texts.

Through careful reading of a great many children's texts from grade levels 3 to 6, it became apparent that many of the passages are written in a kind of "inductive" style. That is, initial sentences are used to lead up to the main point of a paragraph; the main point itself may be stated at the end. Children who use a perseverative text interpretation strategy should find these paragraphs difficult to comprehend. They are likely to use the initial sentences to make an interpretation about the meaning of the whole paragraph and thereby misunderstand the text. Several types of "inductive" formulas are common in materials written for children. These types include:

(1) Refutation--paragraphs in which a belief or idea is stated in the beginning of the paragraph and later said to be false.

(2) Analogy--paragraphs in which the topic--a thing, fact, or idea--is explained by comparing it with another thing, fact, or idea, the analog. There are two subtypes. In a Direct Analogy, the similarity between the topic and the analog is described. In an Opposite Analogy, a contrast between the topic and the analog is described.

(3) Examples-Topic (Explicit)--paragraphs in which instances of a topic are stated. There are two subtypes. In an Explicit Examples-Topic paragraph, the examples are followed by a concluding statement of the topic that is supposed to tie the paragraph together. In an Implicit Examples-Topic paragraph, the unifying topic is not explicitly stated.

Examples of the four types of formulas follow:

Type (1): Refutation

Perhaps you have heard someone say that people live on Mars, that the planet is inhabited. You may have heard someone talk about men from Mars who were supposed to have come to earth in space ships called flying saucers. People have had such imaginative notions about traveling Martians off and on for centuries. As far as we know, there has never been any evidence to support such beliefs. (O'Donnell & Cooper, 1973, p. 43).

Type (2): Analogy

When people overwork, they get very warm and perspire. This helps make the body cooler. Birds, however, don't perspire through their skins. Heat and water leave their bodies through their mouths and they breathe fast to get rid of heat. (Boning, 1976, Level E, Unit 4).

Type (3): Examples-Topic (Explicit)

In a steamy forest, far on the other side of the world, huge elephants are pushing heavy logs. On top of the world

dogs are running over deep snow, pulling loaded sleds behind them. And across far-off deserts camels sway, carrying folded tents and goods for trade. All over the world animals are moving loads for people (Fay, Ross, & LaPray, 1978, p. 20).

Type (3): Examples-Topic (Implicit)

Usually the bones of bird's wings are hollow. This gives the bones strength without weight. The surface of the wing is curved. The fact that the front edge of the wing is thicker than the rear edge also makes for easier flight (Boning, 1976, Level D, Unit 2).

"Deductively" organized paragraph structures are also common in children's texts. These deductive structures appear to be much easier for children who use a perseverative text interpretation strategy (and perhaps for many good readers, too) to understand, for the reader's first hypothesis about the main point of the paragraph is more likely to be correct. Four such structures are reversed variants of the Examples-Topic formula.

(A) Topic-Examples--paragraphs in which a topic is introduced at the beginning of the paragraph and followed by examples of different types.

(B) Topic-Details--paragraphs in which a concept (e.g., object, place, person) is named at the beginning and followed by details that describe it.

(C) Whole-Part--paragraphs in which a whole object or idea is named at the beginning and followed by descriptions of its various parts.

(D) Statement-Reasons--paragraphs that begin with a statement of fact or idea and continue with sentences that give reasons or explanations to support the statement.

The present study identified children who have particular difficulty understanding "inductively" structured passages and studied their responses to other tasks that were designed to reveal or elucidate the use of a perseverative text interpretation strategy.

GROUP SCREENING

Method

Subjects

Two hundred fifty-five subjects participated in the group screening. They were fifth and sixth-grade children drawn from two elementary schools in a white, middle-income suburban community on Long Island. Academic achievement in these schools is generally above average. Reading instruction in both schools is centered around a basal reader approach, but various supplementary materials are used.

Materials

A screening instrument was developed to locate children who use perseverative text processing strategies. The instrument consisted of a booklet of 48 short expository passages, three to four sentences in length, drawn from published children's reading texts of approximately fourth-grade reading level. There were 24 paragraphs written in a deductive style and 24 paragraphs written in an inductive style,

sequenced randomly with the restriction that no more than three of the same type might occur in sequence. The paragraphs included all of the variations in inductive and deductive structures previously described. On a page following each paragraph was a multiple-choice question that asked for the main idea of the paragraph. The instrument had been tried out in a pilot study with 161 fifth- and sixth-grade students at a different school, and items had been evaluated and edited on the basis of the resulting item analysis.

Procedure

The subjects were given the 48 paragraphs to read in their regular classroom groups. Directions were read to the children, and two sample paragraphs and the questions following them were discussed. The children were instructed not to look back once they finished reading each paragraph. They were also told to ask for assistance in reading any difficult words. The children proceeded at their own pace until all paragraphs and questions were completed.

Results

The Kuder-Richardson Formula 20 reliability of the subset of 24 deductive items was .79. The reliability of the subset of 24 inductive items was .83. The intercorrelation of the raw scores on the two subsets of items was .72. The number right on the inductive paragraphs and the number right on the deductive paragraphs were calculated for each student and converted to a regressed standard score. The 16 children with the largest difference score (many more errors on inductive paragraphs) were selected for further study.

INDIVIDUAL ASSESSMENT

Method

Subjects

The children selected on the basis of large difference scores constituted the perseverative group. An equal number of children, matched for total performance on the group screening test, constituted the comparison group. The 16 children selected for the comparison group were chosen from among those children whose regressed standard score for inductive paragraphs was similar to their regressed standard score for deductive paragraphs. Thus, the comparison group had an overall reading ability on the test materials equal to that of the perseverative group, but did not show any tendency to have particular difficulty with inductively structured text. Screening test scores for both groups of children, as well as their most recent report card mark in reading, are shown in Table 1.

Insert Table 1 about here

Materials and Procedure

Four tasks were used in the individual assessment of the subjects in the perseverative and comparison groups:

Task 1: Misleading Paragraphs. Twelve paragraphs were constructed with the intention of misleading readers who tend to perseverate in

Table 1

Inductive and Deductive Regressed Standard Scores[a] for Perseverative Group and Comparison Group Students and Their Most Recent Report Card Marks in Reading

Subject Pair	Perseverative Group Ind.	Ded.	Total	Mark	Comparison Group Ind.	Ded.	Total	Mark
1	37.8	52.2	90.0	C+	44.1	44.4	88.5	B+
2	40.9	54.2	95.1	B	48.8	48.3	97.2	B
3	33.0	62.0	95.0	A	48.8	48.3	97.2	A
4	45.7	58.1	103.8	C+	52.0	52.2	104.2	C
5	36.2	48.3	84.5	B	40.9	40.5	81.5	B
6	44.1	54.2	98.3	C	50.4	50.3	100.7	B
7	34.6	44.4	79.0	C+	39.4	38.6	77.9	B+
8	42.5	52.2	94.8	B	47.3	46.4	93.6	C+
9	42.5	54.2	96.7	B	50.4	50.3	100.7	C+
10	33.0	48.3	81.4	B+	37.8	38.6	76.4	B-
11	44.1	56.2	100.2	C	50.4	50.3	100.7	C
12	37.8	52.2	90.0	C	42.5	42.5	85.0	B
13	37.8	54.2	92.0	B	42.5	42.5	85.0	C
14	44.1	56.2	100.2	C+	53.6	54.2	107.8	C+
15	45.7	56.2	101.8	C	52.0	52.2	104.2	B
16	50.4	60.1	110.5	B	55.2	56.2	111.3	B+
Mean[b]	40.6	54.0	94.6	B-	47.3	47.2	94.5	B-
SD	5.1	4.44	8.3		5.4	5.5	10.9	

[a] Mean = 50, SD = 10.

[b] Mean mark computed by assigning numbers to letters as follows: A = 8, A- = 7, B+ = 6, etc.

applying an initial unconfirmed text interpretation. Each paragraph was designed to evoke a plausible hypothesis at the beginning of the text and eventually made it clear that a different interpretation was necessary. The following is an example of one of these twelve paragraphs:

> It was the first day of school. Teddy seemed a bit nervous. But Mom took him to school just the same. We were all pleased that Teddy was going. We knew it would do him a lot of good to learn new things. It was important that Teddy be trained properly for the show next Spring. A prize at the dog show would make the whole family proud of Teddy. And this school was highly recommended.

The children were given the twelve paragraphs to read silently. To insure that the children read through each entire paragraph, they were asked to follow the text with their fingers as they read. In addition, a reading time measure was taken on each paragraph for all subjects.

Each of the twelve paragraphs was followed by a multiple choice question that tested whether the incorrect interpretation that was encouraged in the beginning had been appropriately revised by the time the entire paragraph had been read. For example, the following question was asked after the paragraph above:

Where is Teddy going today?

a) to an elementary school

b) to a show

c) to a dog school

d) for a walk

Task 2: Recall. Each child was given eight additional inductive paragraphs (like those in the 48-item group screening instrument) to read silently. After each paragraph, the child was asked to tell the examiner all he or she could remember about the story. The recalls were recorded on a portable cassette player.

Task 3: Word Finding. The subjects were given an adaptation of a "children's word-finding test" developed by Pajurkova, Orr, Rourke and Finlayson (1976). In the adaptation constructed for the purposes of this study, each word-finding item was a paragraph consisting of four sentences, each describing a person or object that was always labeled by the nonsense word "grobnick." The child's task was to name the real word that could be substituted for the nonsense word. Twenty-four such paragraphs were constructed. Twelve of these items were written in an "inductive" version in which the most criterial attribute statement came last, and twelve were written in a "deductive" version in which the most criterial attribute statement came first. The paragraphs were randomly sequenced. The following is an example of an item written in an inductive version:

> Every school has grobnicks. You can learn from a grobnick. A grobnick can make you a better reader. A grobnick can give you homework.

The following is the same item written in a deductive version:

A grobnick can give you homework. Every school has grobnicks. You can learn from a grobnick. A grobnick can make you a better reader.

In the actual task, each item was included only in an inductive version or in a deductive version, and in each item grobnick stood for a different person or object. The deductive versions were included to keep the children from establishing a strategy of rejecting the most likely first guess. The examiner read each of the paragraphs to the child, and the child then told the examiner what he or she thought a grobnick was.

Task 4: Reading Rate. Each child was given eight additional paragraphs like those in the screening test to read. Four of the paragraphs were inductive and four were deductive. Reading time was recorded separately for the group of four inductive paragraphs and for the group of four deductive paragraphs.

Each of the students in the perseverative group and each of the students in the comparison group was tested individually. Half of the children were given items in each task in one order and half were given the items in the reverse order. Each of the students was given the four tasks, in the order in which the tasks were described above, in a single session that lasted about 45 minutes.

Results

In order to analyze any possible effect of the order in which the items were administered, order x group (perseverative vs comparison)

analyses of variance were performed on the scores on Task 1 and Task 3. There was no significant main effect or interaction involving order, so orders were combined for all subsequent analyses.

Mean scores on all tasks are shown on Table 2. On the misleading paragraphs (Task 1), the perseverative group scored significantly lower ($t(30) = 4.54$, p .001) than the comparison group.

Insert Table 2 about here

A two-way analysis of variance was performed on the responses to the word-finding items (Task 3) with group (perseverative or comparison) as a between-subjects variable and type of item (inductive or deductive) as a within-subjects variable. The results indicated that perseverative group subjects again had relatively more difficulty with inductive items than deductive items (for group, F (1, 60) = 12.9, $p < .001$; for type of item, F (1, 60) = 0.9; for group x type, F (1, 60) = 27.7, $p < .001$).

Reading time was recorded for the misleading paragraphs (Task 1) in order to determine if subjects in the perseverative group were reading the passages thoroughly. Mean scores for time taken to read all Task 1 passages are shown in Table 2. The reading times for the two groups were almost identical ($t(30) = .50$).

Task 4, which consisted of four inductive paragraphs and four deductive paragraphs that subjects read silently, was timed in order to

Table 1

Means and Standard Deviations for Task 1, Task 3, Time Task 1, Task 4, Recall Analysis

Task 1 Misleading Passages	Mean	SD
Perseverative Group	5.13	2.92
Comparison Group	8.75	1.29

Task 3 Word Finding	Inductive Items		Deductive Items	
	Mean	SD	Mean	SD
Perseverative Group	8.94	1.06	10.56	.72
Comparison Group	11.25	.93	10.13	1.36

Task 1 Reading Time in Minutes	Mean	SD
Perseverative Group	4.80	.31
Comparison Group	4.86	.33

Task 4 Time in Minutes	Inductive Passages		Deductive Passages	
	Mean	SD	Mean	SD
Perseverative Group	1.76	.29	1.76	.25
Comparison Group	1.78	.38	1.54	.34

Recall Analysis	Key Words		Content Words		Total Words	
	Mean	SD	Mean	SD	Mean	SD
Perseverative Group	.62	.43	3.64	2.43	22.53	8.32
Comparison Group	2.07	.36	3.28	2.86	25.26	6.13

determine if subjects were spending different amounts of time reading inductive and deductive passages. Mean scores for time taken to read all four inductive paragraphs and all four deductive paragraphs are shown in Table 2. A two-way analysis of variance was performed on the time taken to read the paragraphs, with group as a between-subjects variable and type of paragraph (inductive or deductive) as a within-subjects variable. Although the means in Table 2 show that the comparison group read deductive passages somewhat more quickly, there was no significant main effects or interactions.

The recalls of the inductive passages (Task 2) were analyzed as follows. For each paragraph, a set of key words and ideas was listed that were judged to be clues to the structure of the paragraph. For example, in paragraphs based on a refutation formula, key words included any adversative (but, yet, still, etc.). Key words might also include a summary word indicative of the examples-topic formula. In a paragraph about things people find in a mailbox, for example, key words include any statement such as "many items," "different things," etc. Each student's recall of each paragraph was given a score based on the number of key words or ideas that occurred in the recall. To be certain that the recall analysis was reliable, a percentage of agreement was obtained based on a second rater's check of the presence or absence of key words in the recalls. The raters

were given the list of possible key words and told to accept any appropriate variations in wording. The results indicated an 82% agreement.

The mean number of key words present in the recalls are shown in Table 2, as well as the total number of words in the recalls. An analysis of covariance was performed on the number of key words present in the recalls with the total number of words in the recall as covariate. The results indicated that comparison group subjects had significantly more key words in their recalls ($F(1, 29) = 126.22$, $p < .001$).

In addition, key words referring to the content in the first part of the paragraph (i.e., before there was a structural signal to the change in topic) were scored for each recall. This was done in order to verify that the recalls of perseverative group subjects were good-faith efforts related to the content in the paragraph. Inter-rater reliability for content words was 87%. The mean numbers of key content words present in the recalls are also shown on Table 2. An analysis of covariance was performed on the number of words referring to the content of the first part of the paragraph with total number of words in the recall as the covariate. The results indicated that there was no significant difference between the groups ($F(1, 29) = 1.24$).

DISCUSSION

The group screening used in this study proved to be a reasonably reliable instrument for identifying children who tend to perseverate in their initial attempts to make sense of text. The task was easy to administer and appeared to be an interesting task for the children who participated. The screening instrument contained paragraphs taken directly from children's reading texts, indicating that children who use perseverative text processing strategies will have special difficulty coping with certain school reading tasks. Children who tend to rely on perseverative processing strategies would likely encounter increasing difficulty as they read higner level reading materials with more varied and complex organizations. In addition, there is an increasing need in the higher grades to rely on information gained from reading. Therefore, such inefficient reading comprehension strategies might increasingly affect what these children learn from school.

The results of this study support the hypothesis that there are readers who use a perseverative text interpretation strategy and that inductively structured text is more difficult for these readers to comprehend. The 16 children who had the largest difference scores on the screening test performed on all subsequent tasks as if they were consistently using such a strategy.

The results of the word finding task (Task 3) indicated that the use of a perseverative text interpretation strategy goes beyond

the reading process. The word finding task was read to the children, yet the perseverative group children performed relatively much better on deductive items than inductive items. Thus, it is possible that perseverative strategies that appear to be operating in text interpretation may also be guiding some children's processing of some types of oral language. During the administration of the word finding task, it appeared to the examiner (S.K.) that several perseverative group children would listen to the first part of an inductive word finding item, act as if they had come to a decision about what a "grobnick" was, and then would not really consider the rest of the information. It seemed apparent that they made an interpretation prematurely and neglected to revise it in line with further information.

Results of the reading rate analyses indicated that children in the perseverative group do not simply read paragraphs so quickly that they read the beginning of the text and ignore the rest of the information. They must be processing the text in some superficial way but do not really integrate the information from different portions of the text. Although the interaction between group and type of passage was not significant, the comparison group subjects did spend relatively more time reading inductive than deductive paragraphs. They may recognize intuitively that paragraph structures that lead up to a main point at the end require more careful reading.

The results of the recall task were informative. Children in the perseverative group recalled approximately the same number of words as did children in the comparison group, but their recalls were qualitatively different. Although both groups tended to recall about the

same number of words referring to the content of the first part of the paragraph, comparison group subjects tended to include key words that cued the inductive structure of the paragraph. They tended to organize their recalls around these structural markers. The following is an example of a paragraph that subjects were asked to recall:

> The tiger's coat is reddish tan on top. Underneath, it gets somewhat white. It is covered with black stripes. There is a plant with orange flowers and black stripes like the tiger's fur. This flower is called a tiger lily.

The following is an example of a comparison group subject's recall organized around the structural cues "there is" and "like."

> There's a flower that looks just like a tiger's fur. It is orange and has black stripes. The flower is called a tiger lily.

The perseverative group subjects, on the other hand, generally omitted the most important structural key words. The following is a perseverative group subject's recall of the same paragraph in which the key words are omitted:

> The tiger has a reddish coat. It is tan on top. Under, it's white. It has black stripes all over it.

In addition, recalls of children in the perseverative group were often elaborations of the child's initial misinterpretation of the main point of the paragraph.

It is most important to consider that inductively structured texts, which frequently mislead children who use a perseverative text interpretation strategy, are commonly found in material that children are expected to read in school. It seems likely that many students who use a perseverative text interpretation strategy might be taught to evaluate their initial hypotheses as they continue reading. One possible approach to such instruction might be to give the child guided practice in recognizing the various inductive text organization "formulas" that give the student particular difficulty. Informal work with a few students suggests that some can readily learn to recognize and respond appropriately to refutation formulas that begin with "some people think that...," or some similar form. Another technique for developing a more flexible approach to the reading task might be to have children read stories from different points of view.

Instruction and practice in using words with multiple meanings might help children who tend to use a perseverative reading strategy develop a more flexible approach to the task of understanding text. They would be taught to access possible meanings for a word based on clues from the beginning of the sentence, and then confirm or reject these tentative hypotheses based on the rest of the sentence.

If children with a perseverative text interpretation strategy can learn more flexible reading strategies, the work reported here has

considerable promise, for a screening instrument for locating such children is now available. While it is not likely that the reliability of such a difference score can ever be made very high in an instrument of acceptable length, even an instrument with modest reliability could be useful in locating children who use a perseverative text interpretation strategy. By choosing only children with large difference scores, a teacher could give special help to children for whom there was a good chance that they had real difficulty with inductively structured materials. For example, with the instrument in its present form, selecting a child with a difference of 1.2 SDs between inductive and deductive scores would mean that there was better than a 50:50 chance of a real difference between the child's comprehension of inductive and deductive paragraphs (Thorndike, 1973).

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